

PRELIMINARY OBSERVATIONS ON THE MATING BEHAVIOUR OF THE AUSTRALIAN MYGALOMORPH SPIDER *AUSTRALOTHELE JAMIESONI* (DIPLURIDAE, ARANEAE, ARACHNIDA)

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When mating, the male of *Australothele jamiesoni* Raven braces open the female's fangs with spurs on his first tibiae while spurs on the second tibiae clamp the first legs of the female at the metatarsal-tarsal joint or distally to it.

□ Behaviour, mating, spider, Mygalomorphae.

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In most mygalomorph spiders whose mating behaviour is known spurs on the first legs of males serve to lock the fangs of females immobile or at least in a 'safe' position; however, some lock the palpal femur or first leg (Coyle, 1985, 1986). This locking of the female's fangs apparently prevents the male being killed and eaten before or during insemination. As with most spiders, until conspecific males are recognised as such they are regarded simply as prey. Spiders observed in this study provide new data for comparison because in males of *Australothele jamiesoni* Raven, 1984, spurs occur on both tibiae I and II. Courtship and

mating of only one Australian mygalomorph, *Atrax infensus*, has been noted (Hickman, 1964). However, Mr Pat Walker of Toowoomba (Australia) did observe and photograph the mating of *Atrax formidabilis* (see Scott, 1980, fig. 21) and of *A. infensus* (in Hickman, 1964). Platnick (1971) divided spider courtship types into three groups, each based upon the nature of the prime releaser of male display. Of the three types, only two are recorded for the Mygalomorphae. Type I requires direct contact of male and female; type II requires only chemotactic perception of silk and/or perception of olfactory pheromones (Platnick, 1971).

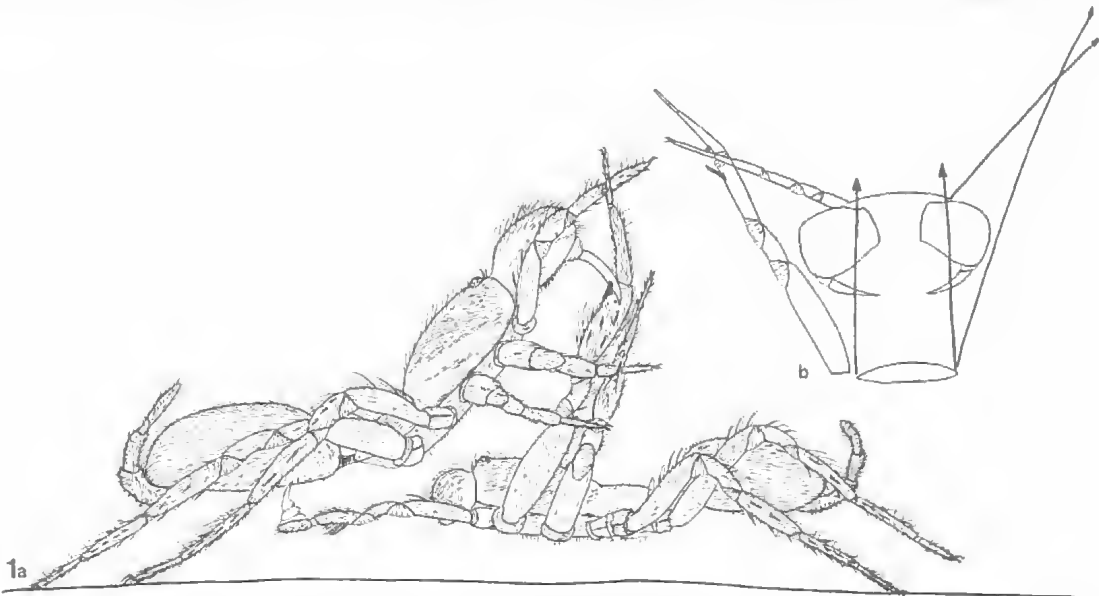


FIG. 1. *Australothele jamiesoni*, male (below) and female (above) mating. a: lateral view; b: semi-diagrammatic sagittal view.

MATERIALS AND METHODS

Males and females of *Australothele jamiesoni* were collected in closed forests of the Brisbane valley in southeastern Queensland. Specimens used were taken from two areas: Newmarket and Brookfield, near Brisbane (three mature females and two males) and Pidna State Forest, about 80 kms northwest of Brisbane (one male).

Males are trapped in pitfalls most commonly in winter (Raven, 1984). Hence, observations were made between 1800 and 0100 hours in a room lit by fluorescent light at ambient temperature and humidity in mid-winter. The observation chamber was covered with red- or green-tinted transparent cellophane to reduce light intensity while still allowing the spiders to be observed. Because the chamber was a round metal dish (c. 18 cms diameter, 5 cms high), spiders could not retreat into corners and interspider contact was inevitable. The male was placed in a glass vial (c. 3 cm long, 0.8 cm in diameter) that was plugged with moist, cotton wool and laid on its side. The vial was placed in different positions relative to the female and her web. All measurements of distances, angles, times, and frequency were estimated.

RESULTS

In nature (and to a lesser extent in the observation chamber), both sexes of *Australothele jamiesoni* build extensive, opaque white webs under and against rocks, logs, and embankments. Those webs usually have several openings leading to tubes that anastomose through the total space that the web occupies.

In the chamber, the female constructed a typical web between the lip and the outer 5–6 cm of the base. Numerous openings were evident and the female was discernible through thin silk of two or three parallel corridors in the main portion of the web. In the vial, the male made a horizontal web suspended across its diameter.

After the vial was in the chamber for 14 days, the plug enclosing the male was removed. Within 2 minutes, the male abandoned the vial and was replaced by the female spinning silk as she moved. She then turned to face out of the vial and the male quickly moved toward her and vibrating his cephalothorax and abdomen in unison. The vibration was a short vertical oscillation (amplitude, 1–2 mm; frequency, about 0.5 Hz). At the same time, the male's pedipalps began 'drumming', a small and inaud-

ible vertical movement of similar amplitude to the preceding vibration but at about 2 Hz. As he approached her, his first legs were raised at about 30–40 degrees to the horizontal. Both his first and second pairs of legs trembled and moved back and forwards, alternating between left and right legs. His approach continued with his palps drumming and in response to that she raised her cephalothorax and first legs to about 30 degrees to the horizontal and incompletely extended her fangs. These positions were attained four times, but were terminated each time when the male turned away and retreated. Each time, the female reinitiated the process by placing her tarsi on his front legs.

After the fifth such encounter, he moved under her pushing her high onto the vial's ceiling. His first legs were arched back along his body at an obtuse angle of about 120–140 degrees to the horizontal. His spur on tibia I and the proximal process on metatarsus I clasped each of her fangs. His second leg was arched back (to a lesser extent) and also laterally. His spur on tibia II and proximal process on metatarsus II clamped the metatarsus-tarsus articulation of her first leg. In that position, the male's palps, having drummed along her fangs, were advanced to her epigastric region where the emboli were inserted one at a time, for about 20 seconds each, with about 2 seconds between insertions. It was not possible to determine to which side of the female epigynum the male palp was applied, but his palp seemed to be parallel to his long axis indicating that his left palp probably inseminated her right spermatheca.

Unfortunately, at that time the chamber was bumped and he appeared either to release or lose his hold of her fangs and legs. In any case, she quickly impaled her fangs through his carapace. In about 30 seconds, he was motionless and transfixed by both fangs of the female. Presumably, she would have ingested him had I not removed him.

In the above case which was the only successful mating observed, the male was slightly smaller than the female. (Carapace length of males of *Australothele jamiesoni* vary from 4–8 mm, and that of females from 5–10 mm). When a putatively conspecific male (QM S590) about twice the size of the female (and from about 100 km from where she was collected) was used, she and other females of similar size repeatedly avoided the male; at no stage did the male respond to the female as a potential mate. However, when similarly sized or smaller males

from localities near those of females were used, both sexes behaved as if confronted by potential mates at some time during the observations. The discrepancy in size between males of *Australothele jamiesoni* from disparate localities was discussed by Raven (1984: 14). Because no consistent morphological difference was observed, all populations were considered conspecific. The potential for electrophoretic studies to falsify that hypothesis is suggested by the avoidance behaviour of specimens from disparate localities.

In many cases, males responded to the web of females by raising and lowering their front legs as if stroking the surface. When the male confronted the female and touched her tarsi, his entire body quivered (amplitude, 1–2 mm). In one case, the male chased the female for several minutes and when she stopped and turned, the male quivered.

One male of *Australothele jamiesoni* was observed charging his palps with sperm. When first observed, he had spun a thin translucent sperm web about 1 cm square suspended from the sides of a jar and its main web. The spider was dorsal side up. Positioning his chelicerae over the sperm web with his palps extended forward over the edge and under it, the male dabbed his palpal bulbs alternately in the visible drop of sperm web hanging down from the web. Each palp dabbed about once per second almost continuously for two hours.

In the mating of *Atrax infensus*, the male pushed the female's cephalothorax into a near-vertical position and appeared to push against the female's fangs (which were closed) with its first legs (Hickman, 1964). Similarly, in the mating position of *Atrax formidabilis* (see Scott, 1980, fig. 21), the first legs are crossed at the distal metatarsi and keep the female's fangs closed. The spur on tibia II of the male operates in conjunction with a process on his second metatarsus, surrounding and presumably locking the female's second femur. Without such support, the female would probably fall backwards during mating. Numerous mating experiments using *A. jamiesoni* were attempted but all save one resulted in apparent undirected chasing of one spider by the other.

DISCUSSION

Because sample sizes were small, the observed behaviour may not be representative or the

difference in the behaviours may not be significant. My assumptions are that they are both representative and significantly different. Also, because mating in *Australothele jamiesoni* and *Atrax* species occurs probably within the confines of either a delicate web or in a very deep burrow, observation of truly natural behaviour may never be possible. In the case of *Australothele* species, the web is significantly damaged before a spider can be found to be present. Hence, how can any behaviour that is observed be considered 'natural'?

I suggest that in mygalomorph taxa in which males possess tibial spurs on the anterior two pairs of legs, mating does not seem to involve a great deal of danger for the male from the female. When a male and female of *Atrax infensus* were kept in the same container for several days, the female made no attempt to attack the male (Hickman, 1964). Of these two *Atrax* species, only *Atrax formidabilis* has a spur present on the male tibia II. In *A. infensus*, both tibiae and metatarsi I and II have numerous spines and tibia II has a slight proximal thickening that could assist locking the female's femur, if such is the case. Hickman (1964) did not give details of the function of the legs of males in mating.

The apparently non-aggressive mating behaviour of *Atrax* contrasts with its general behaviour. If disturbed, males and females of all species found in southeastern Queensland and northern New South Wales immediately take up a classically aggressive striking position: the cephalothorax is arched back, the first three pairs of appendages are raised to vertical or near-vertical positions, the chelicerae diverge at their bases and the fang tips each have a droplet of venom. In contrast, *A. jamiesoni* is not easily induced to assume such a pose.

In mygalomorph taxa in which males have much longer legs and palps than females, e.g. *Cethegus* (see Raven, 1984) and *Migas* (see Wilton, 1968), males may be able to inseminate females without coming within striking range of the female's fangs, as Coyle (1971) suggested is the case in *Aliatypus*. That might also be the case in *Missulena* in which the legs of the male (relative to their carapace length) are several times longer than that of the female. However, in the case of *Missulena* the female is usually much larger; thus presumably reducing any advantage gained through the long legs and palps of the male.

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A RE-EVALUATION OF THE RELATIONSHIPS OF *HELIX (THALASSIA)*
GAYNDAHENSIS BRAZIER, 1875 (MOLLUSCA, PULMONATA, HELICARIONIDAE)

JOHN STANISIC

Stanisic, J. 1988 11 7; A re-evaluation of the relationships of *Helix (Thalassia) gayndahensis* Brazier, 1875 (Mollusca, Pulmonata, Helicarionidae), *Mem. Qd Mus.* 25(2): 475-479. Brisbane. ISSN 0079-8835.

Iredale (1937) listed *Delinitesta gayndahensis* (Brazier, 1875) under the family Flammulinidae, a group of endodontoid snails recently placed in the Charopidae by Solem (1983). Iredale's assessment was based on gross conchological detail. Utilising scanning electron microscopy this assessment is re-evaluated. Results suggest that *D. gayndahensis* is a member of the limacacean family Helicarionidae. A redescription of the species is presented.

□ Mollusca, Pulmonata, Helicarionidae, *Delinitesta gayndahensis* (Brazier, 1875), Relationships, Redescription.

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Iredale (1937) placed a number of problematical genera within the family Endodontidae *sensu lato*. In several cases the placement was purely a matter of convenience and open to many questions. It has already been shown that some of these genera belong to quite different family units. Solem (1958) identified the north Queensland *Theskelomensor* Iredale, 1933, as a helicarionid taxon, while Solem (1959) transferred *Torresiropa* Iredale, 1933, to the Rhytididae as a subgenus of *Ouagapia* Crosse, 1894. *Delinitesta* Iredale, 1933, (type species: *Helix (Thalassia) gayndahensis* Brazier, 1875) and *Queridomus* Iredale, 1937, (type species: *Helix (Conulus) grenvillei* Brazier, 1876) represent two further questionable placements.

A study of the Charopidae of southeast Queensland subtropical rainforests has made it necessary to review the relationships of *Delinitesta gayndahensis* (Brazier, 1875). The status of *Queridomus grenvillei* (Brazier, 1876) will be considered elsewhere.

SYSTEMATIC REVIEW

All specimens used in this study were collected late last century. The lack of recently collected material is most likely a collecting artefact because related field work in south-east Queensland over the past 15 years has been concentrated in the moist, coastal rainforests. The specimens listed in this study represent all known material of *D. gayndahensis* and are in the collections of the Australian Museum (here-

after AM) and South Australian Museum (hereafter SAM).

Genus *Delinitesta* Iredale, 1933

Delinitesta Iredale, 1933, *Rec. Aust. Mus.* 19(1): 54; Iredale, 1937, *Aust. Zool.* 8(4): 321.

DIAGNOSIS

Shell medium in size, spire only slightly elevated, umbilicus very small, whorls about 5, normally coiled, last descending. Apical sculpture of moderately spaced, incised spiral lines. Post nuclear whorls with weak radial growth ridges crossed by numerous very closely spaced wavy incised spiral lines. Body whorl with prominent cord-like keel. Anatomy unknown.

TYPE SPECIES

Helix (Thalassia) gayndahensis Brazier, 1875, by original designation.

NOMENCLATURE AND PREVIOUS STUDIES

Brazier (1875) included *Helix gayndahensis* in the section *Thalassia* Albers, 1860. This was a contemporary catch-all for species with helicoid shells that had few or no sculptural features. Gude (1911) substituted *Nitor* for *Thalassia*, pointing out that the latter had priority in ornithological nomenclature. Hedley (in Hedley and Musson, 1892) considered that conchologically, the species came closest to *Hedleyoconcha* Pilsbry, 1893, (type species: *Helix delta* Pfeiffer, 1856). Iredale (1933) felt